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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/685,004	10/15/2003	Syed Shoaib Hasan Zaidi	INF-105	4281

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EXAMINER	
HO, TU TU V	

ART UNIT	PAPER NUMBER
2818	

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/685,004	HASAN ZAIDI ET AL.	
	Examiner	Art Unit	
	Tu-Tu Ho	2818	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 January 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *17-20* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6 and 12-16* is/are rejected.

7)☒ Claim(s) *7-11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 October 2003 and 03 March 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/15/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

1. The oath/declaration filed on 10/15/2003 is acceptable.

Election/ Restriction

2. Applicant's election without traverse of **Invention I, claims 1-16**, in the reply filed on 01/26/2005 is acknowledged. The election was telephonically confirmed by Attorney of record Patrick J. Finnan on March 30, 2005. The Election Paper was filed, and lost, on 01/26/2005. Both the Legal Instrument Examiners (2800SS01LIE) and Attorney of record Patrick J. Finnan were notified of the missing of the Election Paper, electronically on 03/22/2005 and telephonically on 03/30/2005 respectively.

3. **Claims 17-20** are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 01/26/2005, as detailed above.

Drawings

4. Figures 1(a) through 3(b) (nine figures) should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement

Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: numeral reference **104** (paragraph [0031]) and reference **element 126** (alignment mark 126, paragraph [0025]). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. **Claims 1-6 and 12** are rejected under 35 U.S.C. 102(e) as being anticipated by Kuroda et al. U.S. Patent 6,628,392 (the '392 patent).

The '392 patent discloses in Figures 14 and 19B and respective portions of the specification a resist mask for measuring alignment as claimed.

Referring to **claim 1**, the reference discloses a resist mask ("mask" 1901 with "resist" being interpreted broadly; or 1903/1930 "wafer/resist", with "mask" being interpreted broadly -- column 14, "EXAMPLE 10") for measuring alignment, the resist mask comprising at least one alignment mark (1902 or 1904), wherein the alignment mark includes patterned structures ("periodic minute aperture slit") at least some of whose lateral spacing is smaller than the wavelength of light used for alignment measurement (column 2, lines 50-60).

Referring to **claim 12** and using the same reference characters and citations as detailed above for claim 1 where applicable, the reference discloses a resist mask for measuring alignment, the resist mask comprising at least one alignment mark, wherein the alignment mark comprises at least two distinct regions (groups of alignment marks 1902, defined generally by 1908, or groups of alignment marks 1904, defined generally by 1908, and "distinct" is interpreted broadly), at least one distinct region formed from a plurality of patterned structures ("periodic minute aperture slit") at least some of whose lateral spacing is smaller than the wavelength of light used for alignment measurement.

Referring to **claims 2 and 3**, the reference further discloses that the patterned structures (periodic minute aperture slits 1902 or 1904) further comprise a plurality of isolated resist

features ("periodic minute aperture slits", with "resist" being interpreted broadly – i.e., the minute aperture slits could be formed of a material resistant (un-changed) to a lithographic patterning process rather than formed (changed) by a lithographic patterning process) and that the features are arrayed.

Referring to **claim 4**, the reference further discloses that the patterned structures further comprise a stochastic assembly of features ("random", column 11, EXAMPLE 6).

Referring to **claim 5**, the reference further discloses that the patterned structures appear rectangular in cross-section and top view (column 11, EXAMPLE 6).

Referring to **claim 6**, the reference further discloses that the lateral spacing of the patterned structures is less than about half the wavelength of light used for alignment measurement (column 4, lines 45-55, wavelength of light used for alignment measurement: about 530 nm, lateral spacing of the patterned structures ("pitch between adjacent apertures"): 160 nm).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. §103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 13-16** are rejected under 35 U.S.C. §103(a) as being unpatentable over the '392 patent in view of Kreuzer U.S. Patent Application Publication 20050041256.

The '392 patent discloses a resist mask for measuring alignment as claimed and as detailed above for claim 12 including the at least two distinct regions, the at least two distinct regions including characteristic spacing between features. However, the reference fails to disclose that the characteristic spacing is different between regions, and further fails to disclose that the mark comprises two concentric regions, the outer region comprising a smaller characteristic feature spacing than the inner region.

Kreuzer, in disclosing an alignment mark system for semiconductor, teaches that determination of the center of the entire alignment signal including the envelope factor, the use of two or more periodic alignment marks of slightly different periods, and/or the use of non-periodic patterns including isolated features and lines or checkerboards of variable but symmetrical patterning will eliminate the positional ambiguity caused by alignment in semiconductor processing (paragraph [0061]). In other words, Kreuzer teaches that the mark comprises two concentric regions with different characteristic spacing.

Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the reference's alignment mark having two concentric regions, an inner region and an outer region, with different characteristic spacing. One would have been motivated to make such a change because such an alignment mark would reduce overlay uncertainty ("positional ambiguity") as taught by Kreuzer. And although the concentric inner region and the concentric outer region of the modified alignment mark does not comprise the limitation "the outer region comprising a smaller characteristic feature spacing than the inner region", the outer region and the inner region, which has different characteristic spacing, could comprise a smaller characteristic feature spacing than the inner region, or could comprise a

larger characteristic feature spacing than the inner region, either of which limitations would improve overlay uncertainty, and therefor the change from one to the other would have been obvious.

8. **Claim 1-3, 6, and 12-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowes U.S. Patent 6,778,275 (the '275 patent) in view of Dirksen et al. U.S. Patent 6,417,922 or in view of Miyatake U.S. Patent 5,141,322.

The '275 patent discloses in the figures, particularly Figs. 2, 4, and 7, and respective portions of the specification a resist mask for measuring alignment substantially as claimed.

The '275 patent discloses a structure for measuring alignment, the structure comprising at least one alignment mark (250 or 290, Fig. 2, 450 or 490, Fig. 4, or 750 or 830, Fig. 7, column 4 through column 5, or column 13, lines 58-67), wherein the alignment mark comprises at least two distinct regions, at least one distinct region formed from a plurality of patterned structures (as evident from the figures), at least some of whose lateral spacing is about 150 nm (column 6, line 50 through column 7, line 40, particularly column 7, lines 8-11, in particular, lateral spacing P1 (pitch P1) is about 150 nm (0.15 microns) and lateral spacing P2 is about 500 nm, column 5, lines 26-34). In other words, the reference discloses a structure as recited in **claims 1 or 12** except for the limitation "resist mask" and except for the limitation "whose lateral spacing is smaller than the wavelength of light used for alignment measurement".

However, for the limitation "mask", the reference discloses that the structures of Figs. 2, 4, and 7 can be "patterned onto wafer 150 from mask 120" (column 4, lines 45+); or in other words, the structure can be the mask or the wafer, which inherently comprises a mask of sorts for

subsequent processing. For the limitation "resist", the reference teaches: "Transferring an image from mask 120 to wafer 150 is a multi-step process. This multi-step process first includes applying photoresist onto wafer 150....Optical projection element 130 includes one or more lenses that project the rays through mask 120 onto portions of the photoresist layer of wafer 150" (column 4, lines 12-32"); it would appear that "photoresist" is the functional equivalent to the claimed resist mask.

Thus what is explicitly missing from the '275 patent is the limitation "whose lateral spacing is smaller than the wavelength of light used for alignment measurement".

Dirksen, in disclosing a structure for measuring alignment, teaches that the longer the wavelength, such as wavelength of 1060 nm, is used for the alignment radiation, the smaller the alignment error (column 9, lines 54-61). Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the reference's resist mask for measuring alignment using a longer wavelength such as 1060 nm, which is larger than the lateral spacing of 150 nm as disclosed by the reference, or in other words as "whose lateral spacing is smaller than the wavelength of light used for alignment measurement". One would have been motivated to make such a change because longer wavelength, as taught by Dirksen, reduces alignment error.

Miyatake, in disclosing a structure for measuring alignment, teaches that the longer the wavelength, such as wavelength of 577 nm, is used for the alignment radiation ("alignment wavelength"), the less deterioration to the alignment marks (Fig. 14, and column 3, lines 40-55). Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the reference's resist mask for measuring alignment using a longer wavelength

such as 577 nm, which is larger than the lateral spacing of 150 nm as disclosed by the reference, or in other words as "whose lateral spacing is smaller than the wavelength of light used for alignment measurement". One would have been motivated to make such a change because longer wavelength, as taught by Miyatake, reduces deterioration to alignment marks.

Referring to **claim 6**, the combined reference further discloses that the lateral spacing of the patterned structures is less than about half the wavelength of light used for alignment measurement (for example 150 nm versus 1060 nm).

Referring to **claim 13**, the combined reference further discloses that each region of the at least two distinct regions (such as 230 and 270) includs characteristic spacing between features, the characteristic spacing being different between regions (as is evident form the figures of the '275 patent).

Referring to **claims 2, 3, and 14**, the patterned structures of the modified structure of the combined reference further comprise a plurality of isolated resist features ("resist", as the features are "transferred" from a mask) arranged to impart the desired size and shape of the alignment mark and that the features are arrayed.

Referring to **claims 15 and 16**, the combined reference further discloses that the mark comprises two concentric regions (such as region 730/740/.../800 and region 810/820/.../880 depicted in Fig. 7 of the '275 patent) comprising an inner region and an outer region, with different characteristic spacing. Although the concentric inner region and the concentric outer region of the modified alignment mark does not comprise the limitation "the outer region comprising a smaller characteristic feature spacing than the inner region", the structure appears to possess the limitation "the inner region comprising a smaller characteristic feature spacing

than the outer region", which appears to be opposite to the claimed limitation. Nevertheless, either of the limitations, disclosed or claimed, would improve overlay uncertainty, and therefor the change from one to the other, i.e., from "the inner region comprising a smaller characteristic feature spacing than the outer region" to "the outer region comprising a smaller characteristic feature spacing than the inner region" would have been obvious to one or ordinary skill in the art at the time the invention was made.

Allowable Subject Matter

9. Claim 7 and dependent-upon-claim-7 claims 8-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for the indication of allowable subject matter: The cited art, whether taken singularly or in combination, especially when all limitations are considered within the claimed specific combination, fails to teach or render obvious a resist mask for measuring alignment having *all* limitations as recited in claims 1 and 7, characterized in the continuous resist layer upon which the patterned structures are formed.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TH

Tu-Tu Ho
March 31, 2005